

CLASSIFICATION

LEVELS

- KINGDOM
- PHYLUM
- CLASS
- ORDER
- FAMILY
- GENUS
- SPECIES

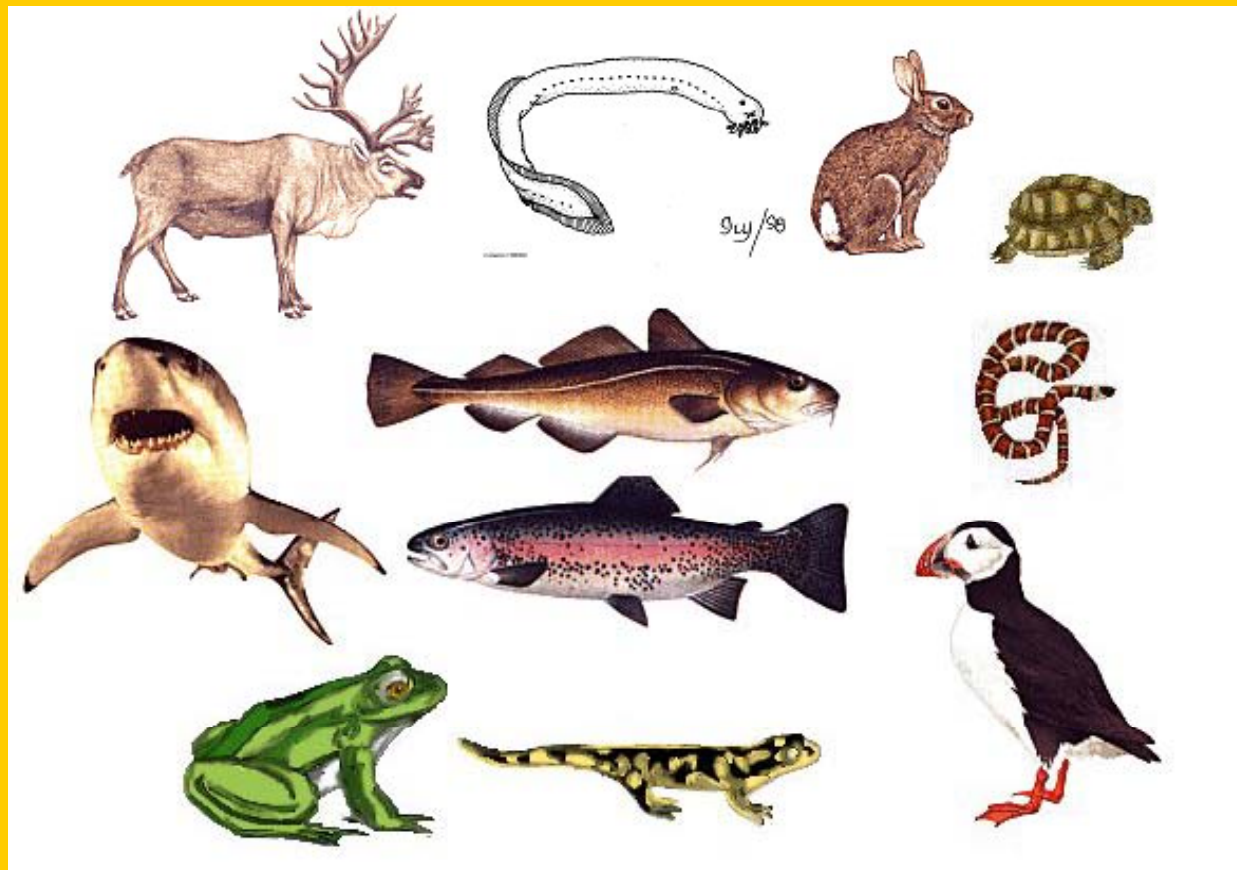
Classification of ME!

- Animalia
 - Multicellular,
mobile, eukaryotic,
heterotroph



- Chordata

- Dorsal nerve chord, pharyngeal gill slits, bilateral symmetry



MAMMALS

EGG-LAYING MAMMALS
 These are the monotremes. They lay large, leathery eggs, which are incubated for a long time. They have a cloaca, a single opening for the digestive, urinary, and reproductive tracts. They have a placenta, but it is very different from that of other mammals. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

MARSUPIALS
 These are the marsupials. They are born at an early stage of development. They pass a short period in the womb, then they crawl into the mother's pouch, where they continue to develop. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

PLACENTAL MAMMALS
 These are the placental mammals. They are born at a late stage of development. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Neotomata
 Order: Monotremata, Family: Ornithomyrmecidae
 This is a very primitive mammal, with a long, pointed snout and a large, powerful jaw. It has a long, pointed snout and a large, powerful jaw. It has a long, pointed snout and a large, powerful jaw.

Marsupialia
 Order: Marsupialia, Family: Diprotodontidae
 These animals have traditionally been considered to be one of the most primitive mammalian orders. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Flying Lemurs
 Order: Dermoptera, Family: Dermoptera
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Elephant Shrews
 Order: Soricomorpha, Family: Soricidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Insectivores
 Order: Soricomorpha, Family: Soricidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Tree Shrews
 Order: Scandentia, Family: Tupaia
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Hyraxes
 Order: Hyracoidea, Family: Hyracoidea
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Monkeys & Apes
 Order: Primates, Family: Hominoidea
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Carnivores
 Order: Carnivora, Family: Felidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Rabbits, Pikas, and Hares
 Order: Lagomorpha, Family: Leporidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Rodents
 Order: Rodentia, Family: Muridae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Old-World Ungulates
 Order: Artiodactyla, Family: Bovidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Elephants
 Order: Proboscidea, Family: Elephantidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Even-toed Ungulates
 Order: Artiodactyla, Family: Cervidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Aardvark
 Order: Pilosa, Family: Vombatidae
 This animal has a long, pointed snout and a large, powerful jaw. It has a long, pointed snout and a large, powerful jaw. It has a long, pointed snout and a large, powerful jaw.

Bats
 Order: Chiroptera, Family: Chiroptera
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Shrews, Armadillos & Anteaters
 Order: Soricomorpha, Family: Soricidae
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Pangolins
 Order: Pholidota, Family: Pholidota
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Seals, Sea Lions and Walrus
 Order: Pinnipedia, Family: Pinnipedia
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Whales, Dolphins and Porpoises
 Order: Cetacea, Family: Cetacea
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

Sea Cows
 Order: Sirenia, Family: Sirenia
 These animals have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw. They have a long, pointed snout and a large, powerful jaw.

- Mammalia
 - Middle ear bones,
 - mammary glands,
 - endotherm, hair

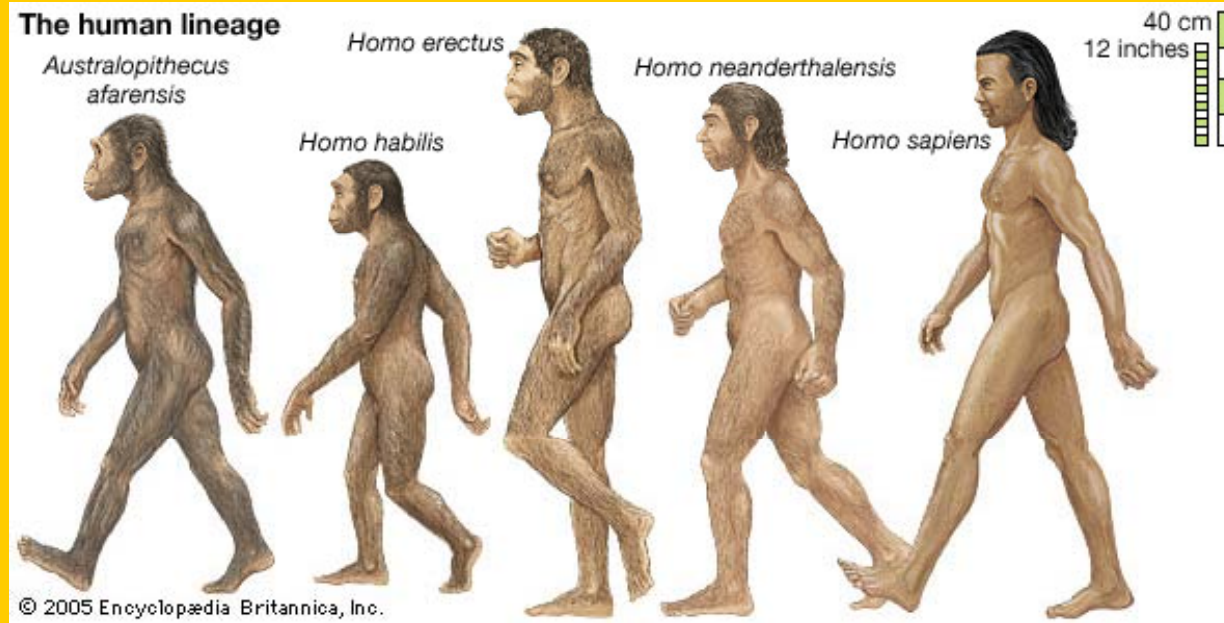


- Primates
 - Opposable thumbs, stereoscopic vision, grasping hand, brow ridge



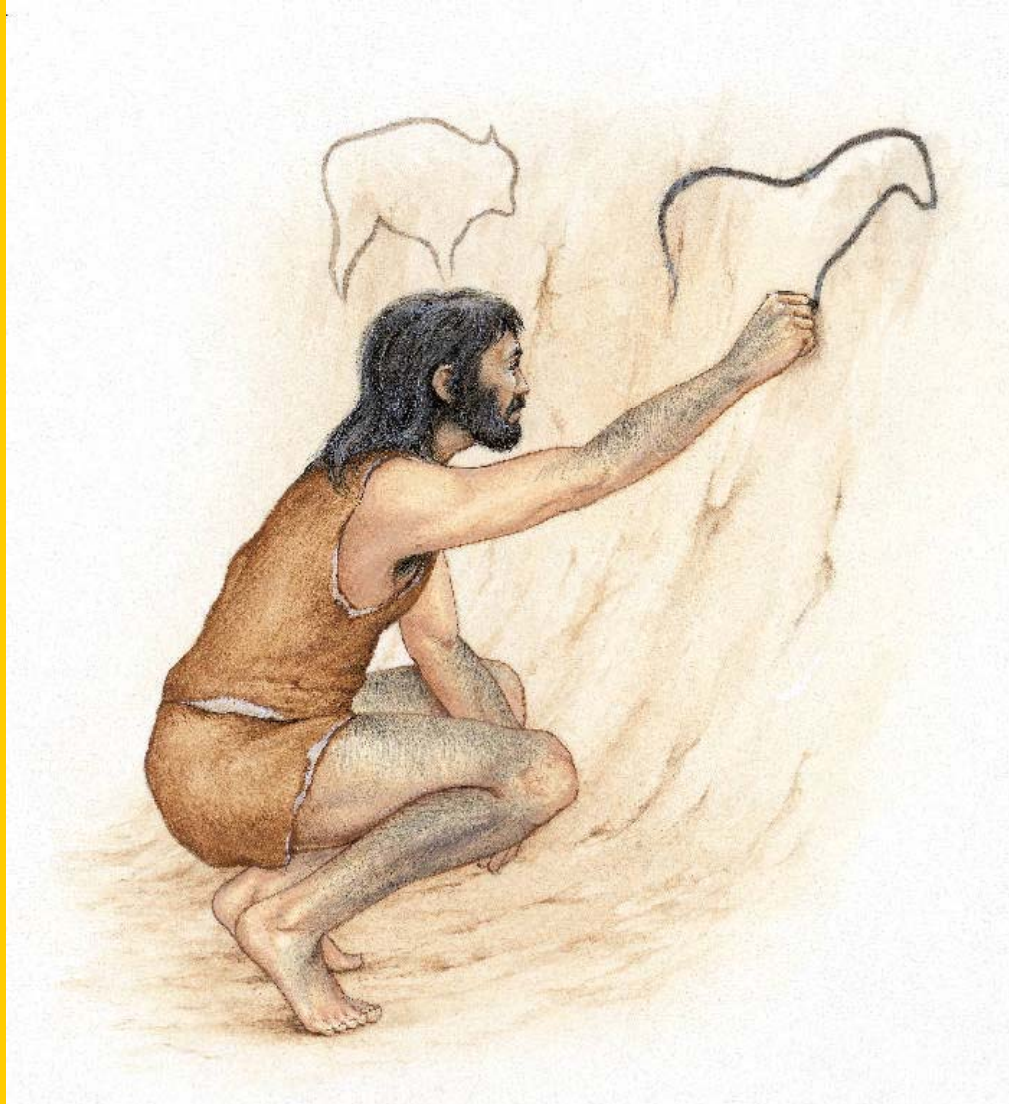
- Hominidae

- Bipedal (walk upright), long arms & long curved fingers, primitive rounded molars



- Homo

- Same body, tool use, language, culture, raised forehead, rounder skull, reduced teeth, shorter arms, longer legs, more delicate skeleton



- *Homo sapiens*
(KNOW THE RULES!)

- “knowing man” or modern man, 1400 ml cranial capacity, sunken cheekbones, thinner skull, small brow ridge

ORGANIZING LIFE

How did life come to exist on Earth?

- Billions of years ago the atmosphere was made of water vapor, Nitrogen, Methane, Ammonia, Carbon Dioxide, and Hydrogen
- **NO OZONE** layer to protect from sun's UV radiation
- **Free Oxygen** (what we breathe) began to form by release of O₂ from water vapor
- *approximately the time in Earth's history that life began

Where did early life forms live? Why?

- In the oceans, several meters below the surface
 - Water provided protection from UV radiation



How did early life forms get nutrition?

- 1ST life forms were probably **heterotrophs**
 - Obtain NRG by eating other organisms
- Later, some of these consumers changed to obtain their NRG by **chemosynthesis**
 - Process in which NRG from chem. rxns of diff. nutrients is used to synthesize food
- As nutrients were used up, **photosynthesis** evolved
 - Process that uses **light, CO₂ & H₂O** to synthesize food and **produce O₂**
 - **THESE ORGANISMS WERE THE 1ST AUTOTROPHS!**
 - Make their own food/NRG
 - As producers released more and more **O₂**, the **Ozone layer** was formed around Earth

Multicellular organisms eventually evolved from the earlier unicellular life forms (endosymbionts...? Eating one another and combining genetic information?)

After millions of years, the biosphere became a complex system with diverse life forms

CLASSIFICATION

- Grouping of things for practical purposes based on similarities
- Recognize relationships by comparisons of all available characteristics of each species

TAXONOMY

- Science of grouping and naming organisms
- Purpose? = to use information from many different sources in order to classify organisms
- Modern taxonomy attempts to produce a system of natural classification

Taxonomy Cont...

- Based on **evolutionary relationships**
 - Means that closely related organisms **have more characteristics in common than those that are less related**
 - Relationships are determine by:
 - 1. **phylogeny (evolutionary history)**
 - 2. **development**
 - 3. **biochemistry**
 - 4. **behavior**
 - organisms are grouped into a series of categories, each one larger than the previous

Why don't we just use common names?

- Common names can be misleading... an organism with a common name may not have the same common name in another region OR a common name may refer to more than 1 organism (depending on the region)



• specify each organism to avoid
ambiguity for confusion
"orange" → it will



it's

Scientists

- 1. Aristotle
 - Classified all living things as **plants or animals**
- 2. Carolus Linnaeus
 - Developed the **modern classification system**
 - **Binomial Nomenclature**
 - 2-word naming system
 - Selected characteristics that lead to more natural groupings of species

Scientists cont...

- 3. Ernst Haeckel

- Placed **unicellular** organisms into **Kingdom Protista**
- Separated **bacteria** from the rest of the unicellular organisms b/c they **had no nucleus**
- Presence or absence of a nucleus in a cell distinguishes the 2 major types of cellular organization
 - **Prokaryote = no nucleus**
 - **Eukaryote = true nucleus**

Phylogeny — “phylon” – related group “geny” - origin

- Evolutionary history of a species
- Scientists compared modern-day organisms to fossils of similar forms as they classified organisms
- Evolution of a species is represented by branching into 6 kingdoms from a common origin
- Kingdoms can be distinguished by the method in which they obtain food, cellular structures, and chemical makeup of cells

THE 6 KINGDOMS

ARCHAEBACTERIA

- Primitive bacteria that live in extreme environments; cell walls without peptidoglycan
- Similar to the extreme conditions of newly formed Earth
 - i.e. very hot, high salinity (salt content)

EUBACTERIA or BACTERIA

- Contains only unicellular prokaryotes with cell walls with peptidoglycan
- Appeared about 3.5 bya according to the fossil record
- Over 10,000 known species (named & described)
- Obtain food by chemosynthesis or photosynthesis
- May have a cell wall and flagella or cilia
 - Flagella = long whip-like structure for movement
 - Cilia = short numerous hair-like structures for movement

PROTISTA

- Combination of different characteristics → some plant-like, animal-like, fungus-like
- Eukaryotes w/o complex organ systems or tissues
- Autotrophs or heterotrophs
- 1ST appeared in the fossil record 1 bya
- Most are unicellular, but some are multicellular (ex. Seaweeds & algae)

FUNGI

- Used to be classified **as plants**
 - Have a close association with plants
 - Believed that ancient partnerships with plants were vital to the survival of early plant species
 - Some species of fungi live in association with the roots of plants & provide plants w/nutrients
- Unicellular (yeasts) or multicellular (mushrooms, puffballs, truffles)
- **Eukaryote**
- **Decomposers (heterotrophs)**
- Over 100,000 known species
- 1ST appeared in the fossil record about 400 mya

PLANTAE

- Multicellular
- Autotrophs
- Eukaryotes
- Defined tissue systems w/specific fxns
- Ancestors were most likely green algae of Kingdom Protista
- 1ST appeared in the fossil record 400 mya
- 500,000 known species
- Provide Earth with O₂ for life processes in organisms
 - Also important to Earth's ozone layer

ANIMALIA

- Multicellular
- Heterotroph
- Eukaryotes
- Mobile & most complex body structures
- Over 1 million known species
- Some are microscopic (mite), others are among largest organisms on earth (whale)
- 1ST appeared in the fossil record 700 mya

REMINDERS: levels of organization

DOMAIN — Archaea, Bacteria, Eukarya

KINGDOM — Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia
Monera

PHYLUM

CLASS

ORDER

FAMILY

GENUS

SPECIES

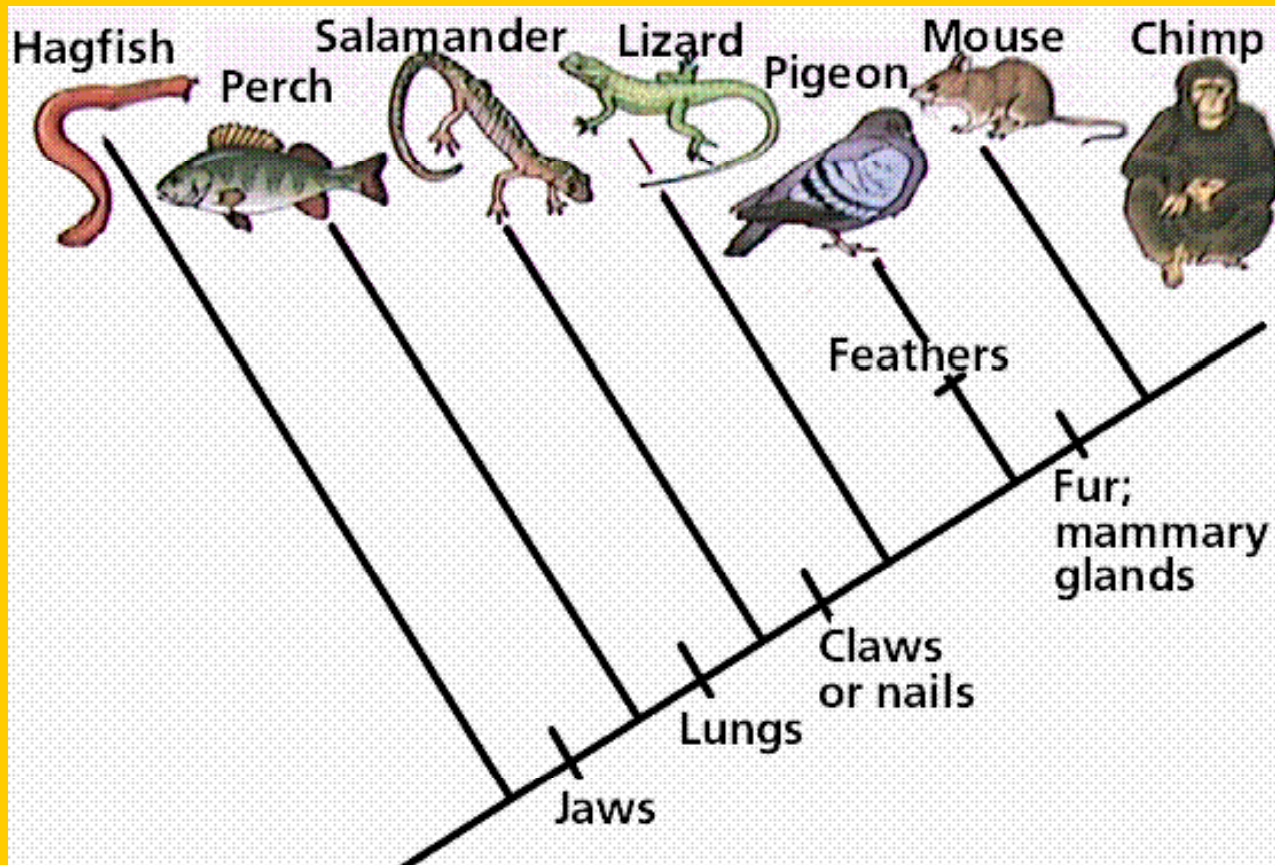
REMINDERS: Dichotomous Key

Dichotomous Key

1. a. Flying (go to 2)
b. Not flying (go to 6)
2. a. Feathered (go to 3)
b. Not feathered.....Little Brown Bat (*Myotis lucifugus*)
3. a. Web footed, water living..... Mallard Duck (*Anas platyrhynchos*)
b. Not web footed, not water living (go to 4)
4. a. Hovering flight, very smallRuby Throated Hummingbird (*Archilochus colubris*)
b. Not hovering flight (go to 5)
5. a. Mouse eater, nocturnal..... Great Horned Owl (*Bubo virginianus*)
b. Insect eater, diurnal.....American Robin (*Turdus migratorius*)
6. a. Hairy or furred (mammalian) (go to 8)
b. Not furred (not mammalian) (go to 7)
7. a. Legs present..... Leopard Frog (*Rana pipiens*)
b. Legs absent.....Red Sided Garter Snake (*Thamnophis sirtalis parietalis*)
8. a. Aquatic mammal..... Harbor Seal (*Phoco vitulina*)
b. Terrestrial mammal (go to 9)
9. a. Hopping or jumping locomotion (go to 10)
b. Not hopping or jumping locomotion (go to 11)
10. a. Large with large tail used for balance.....Red Kangaroo (*Macropus rufus*)
b. Small with small bobbed tailJack Rabbit (*Lepus townsendii*)
11. a. Large, flat, leathery tail.....Beaver (*Castor Canadensis*)
b. Tail not leathery and flat (go to 12)



REMINDERS: Cladogram



Which characteristic is shared by all of the organisms except the hagfish?

Which organism has all of the derived characteristics present?

REMINDERS: How to read a chart



organism	1	2	3
Common Name	Hamster	Gerbil	Guinea Pig
Class	Mammalia	Mammalia	Mammalia
Order	Rodentia	Rodentia	Rodentia
Family	Cricetidae	Muridae	Caviidae
Genus	Mesocricetus	Gerbillurus	Cavia

What is the common name for the pet in Genus Cavia?

What is the Order for the gerbil?